CLAIMS

1. A sensor system for measuring the concentration, or indicating the presence or presence at a predetermined level of, a target contaminant species in an aqueous medium comprises a sensor element having a sample receiving area for receiving a sample of aqueous medium to be sampled and which comprises at least three electrodes each comprising a layer of conductor deposited upon an insulating substrate, and further comprises a power source adapted to apply a pre-determined potential difference across two of the electrodes determined by the potential associated with an electrochemical reaction characteristic of the target species, and output means to output data corresponding to the current generated thereby when a sample is in place on the sampling area.

2. A sensor system in accordance with claim 1 further comprising a pH buffering agent to be combined with a test solution when it is placed for testing on the sample collection area and selected to adjust the pH of the sample to a value acceptable and necessary for the characteristic electrochemical process to be tested.

3. A sensor system in accordance with claim 2 wherein the buffering agent is selected to vary the pH of the initial solution to free into solution a species related to and indicative of the contaminant species under test, the characteristic electrochemical process to be tested by the sensor being one involving this related species.

4. A sensor system in accordance with any preceding claim further comprising a standard reference reagent to be combined with a test

solution when it is placed for testing on the sample collection area to set up a suitable standard reference cell in situ involving the reference electrode to provide a reference for the working electrode.

5. A sensor system in accordance with one of claims 2 to 4 wherein the sensor electrode element is provided with a layer of a suitable chemical species deposited on the upper surface in the sample collection area such as to be rapidly and very soluble in the aqueous sample and placed thereon to effect formation of the said reference solution and/or buffering solution.

6. A sensor system in accordance with claim 5 wherein the suitable chemical species is deposited directly on the electrode area to form a dry layer thereon.

7. A sensor system in accordance with claim 5 wherein the system further comprises a matting layer applicable to the electrode surface during use and pre-impregnated with the suitable chemical species.

8. A sensor system in accordance with any preceding claim wherein a power source is integrated into a circuit with the sensor such the sensor is caused to function as a potentiostat.

9. A sensor system in accordance with claim 8 wherein the power source comprises control means such as to act in combination with the sensor to create a differential pulsed square wave voltammetric circuit.

10. A sensor system in accordance with any preceding claim wherein the power source is a portable electrical power source for use in the field.

11. A sensor system in accordance with any preceding claim further comprising display means to display the output data in a user readable form.

12. A sensor system in accordance with claim 11 wherein the display comprises an alphanumeric display indicative of the current generated in the circuit at steady state under test and/or indicative of the concentration and/or presence of the target species in the sample.

13. A sensor system in accordance with claim 11 or claim 12 wherein the display comprises a digitised display adapted to indicate one of a small number of discrete states, for example presence or absence of the target species, or presence at a small number of pre-determined levels.

14. A sensor system in accordance with any preceding claim wherein the insulating support substrate has hydrophobic surface properties to assist in the retention of a static sample in the sample collection area during sampling.

15. A sensor system in accordance with any preceding claim wherein the at least three electrodes are deposited on a single supporting substrate.

16. A sensor system in accordance with any preceding claim wherein at least some of the at least three electrodes are provided concentrically in the sample collection area.

17. A sensor system in accordance with claim 16 wherein three electrodes are provided and the electrodes comprise a first electrode making up a

central generally circular portion, and second and third electrodes concentrically annular or partially annular there around.

18. A sensor system in accordance with claim 16 wherein four electrodes are provided and the electrodes comprise a first electrode making up a central generally circular portion, and second and third annular electrode portions concentrically annular or partially annular there around, wherein, one or other of the outer annular electrode areas is divided into two mutually insulating portions, to comprise two of the four electrodes.

19. A sensor system in accordance with any preceding claim wherein the electrodes may comprise thin films of conducting metallic material laid down upon an insulating substrate.

20. A sensor system in accordance with any preceding claim wherein the electrodes are fabricated from noble metals of high purity of materials selected from silver, gold, platinum, palladium in substantially pure form or as alloyed combinations thereof

21. A sensor system in accordance with claim 20 wherein the said noble metals or alloys thereof have additional impurity levels of less than 0.5%, more preferably less than 0.05% and more preferably still less than 0.01%.

22. A sensor system in accordance with any preceding claim wherein the sensor includes temperature measuring means and/or means to input a measured temperature at the time of sampling, and further comprises

means to make a temperature compensation to raw output data based upon this temperature measurement relative to standard conditions.

23. A sensor system in accordance with any preceding claim wherein the sensor includes conductivity measuring means to measure solution conductivity, and further comprises means to make a compensation to raw output data based upon this measurement relative to standard conditions.

24. A method of measuring the concentration, or indicating the presence or presence at a predetermined level of a target contaminant species in an aqueous medium comprising the steps of:

applying a sample of aqueous medium to be tested on a sample collection area of a sensor element comprising at least three electrodes each comprising a layer of conductor deposited upon an insulating substrate;

connecting the electrode to a power source to set up a control circuit, for example a potentiostatic type or other suitable circuit, applying a pre-determined potential difference determined by the potential associated with an electrochemical reaction characteristic of the target species;

awaiting the establishment of a steady state or quasi steady state;

outputting data associated with the current of said steady state;

25. A method in accordance with claim 23 comprising the further steps of converting the said output current data into data indicative of the presence or presence at a pre-determined level and/or level of concentration of the target species in the sample;

and/or displaying the output data or converted data on suitable user readable display means;
and/or transmitting the output data or converted data to suitable data storage and/or processing means.

26. A method in accordance with claim 23 or 24 comprising the further step of causing a suitable chemical species to go into solution in the aqueous medium to be tested to create a suitable reference solution for the pre-determined electrochemical reaction.

27. A method in accordance with one of claims 23 to 25 comprising the further step of causing a suitable buffering agent to go into solution in the aqueous medium to be tested to adjust the pH of the sample to a value acceptable and necessary for the characteristic electrochemical process to be tested.

28. A method in accordance with one of claims 25 or 26 wherein the said reference or buffer reference solution is created by addition of a suitable chemical species to the collected sample in situ in the sample collection area.

29. A method in accordance with one of claims 25 or 26 wherein the sample collection area of the sensor element is first pre-prepared by provision of the suitable chemical species deposited thereon in solid form and able to go into solution when the aqueous sample is applied thereto to effect formation of the reference solution.